Physics 30

Physical constants that may be used for calculations:

Universal Gravitation Constant: $G = 6.67 \times 10^{-11}$ Nm^2/kg^2

One coulomb = 6.24×10^{18} elementary charges

$e = 1.602 \times 10^{-19}$ C

Constant in Coulomb's Law: $k = 2.31 \times 10^{-28}$ Nm^2 /(elem. ch)^2

$k = 8.99 \times 10^{9}$ Nm^2/C^2

Speed of light, $c = 3.00 \times 10^{8}$ m/s

Electron volt, eV = 1.60×10^{-19} J

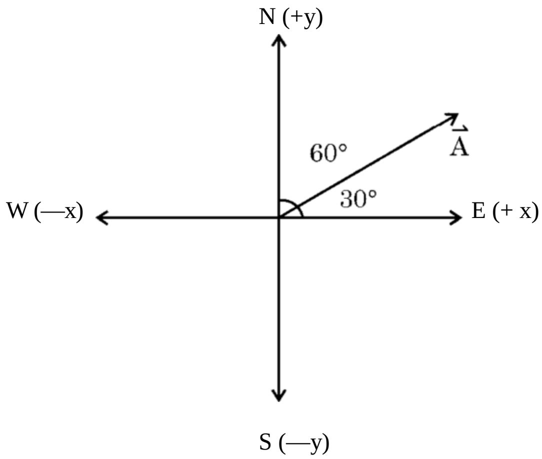
1 kilowatt-hour = 3.6 MJ
=3.6×10^{6} J

Acceleration due to gravity (at Earth's surface), $g = 9.81$ m/s^2 towards Earth's centre
or $g = -9.81$ m/s^2

The following list of symbols indicates the symbols that have been adopted by the International Committee for Weights and Measures for use in the world-wide metric system (SI). These symbols are used throughout this test paper.

Unit	Symbol	Unit	Symbol
amperes	A	newtons	N
coulombs	C	ohms	Ω
hertz	Hz	seconds (time)	s
joules	J	volts	V
kilograms	kg	watts	W
metres	m		

Conventions used for expressing direction in Vector Quantities



Example:

The direction of vector A can be expressed as:

[E 30° N] or [N 60° E] or [30° N of E] or [60° E of N]

Physics Formulas

Some Useful Things

$$c^2 = a^2 + b^2$$
$$c^2 = a^2 + b^2 - 2ab\cos C$$
$$\frac{\sin A}{a} = \frac{\sin B}{b} = \frac{\sin C}{c}$$
$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$
$$A = \pi r^2$$

Kinematics and Dynamics

$$\sum \vec{V}_x = \vec{V}_{x1} + \vec{V}_{x2} + \vec{V}_{x3} + \cdots$$
$$\sum \vec{V}_y = \vec{V}_{y1} + \vec{V}_{y2} + \vec{V}_{y3} + \cdots$$
$$\vec{V}_R = \sqrt{\left(\sum \vec{V}_x\right)^2 + \left(\sum \vec{V}_y\right)^2}$$
$$v_{av} = \frac{\Delta d}{\Delta t}$$
$$\vec{V}_{av} = \frac{\Delta \vec{d}}{\Delta t}$$
$$\vec{a}_{av} = \frac{\Delta \vec{v}}{\Delta t}$$
$$\vec{v}_2 = \vec{v}_1 + \vec{a}\Delta t$$
$$\vec{v}_{av} = \frac{\vec{v}_2 + \vec{v}_1}{2}$$
$$\Delta \vec{d} = \frac{1}{2}(\vec{v}_2 + \vec{v}_1)\Delta t$$
$$\Delta \vec{d} = \vec{v}_1 \Delta t + \frac{1}{2}\vec{a}(\Delta t)^2$$
$$\Delta \vec{d} = \vec{v}_2 \Delta t - \frac{1}{2}\vec{a}(\Delta t)^2$$
$$\vec{v}_2^2 = \vec{v}_1^2 + 2\vec{a}\Delta\vec{d}$$
$$\vec{F}_{NET} = \vec{F}_1 + \vec{F}_2 + \vec{F}_3 + \cdots$$
$$\vec{F}_g = m\vec{g}$$
$$\vec{F}_{NET} = m\vec{a}$$
$$F_f = \mu F_N$$
$$T = \frac{t}{cycles}$$
$$f = \frac{cycles}{t}$$
$$T = \frac{1}{f}$$
$$f = \frac{1}{T}$$
$$\vec{v} = \frac{2\pi r}{t}$$
$$\vec{v} = \frac{2\pi r}{T}$$
$$\vec{a} = \frac{\vec{v}^2}{r}$$
$$\vec{a} = \frac{4\pi^2 r}{T^2}$$
$$\vec{a} = 4\pi^2 r f^2$$
$$\vec{F}_c = m\vec{a}_c$$
$$\vec{F}_g = \frac{G m_1 m_2}{\vec{d}^2}$$
$$\vec{p} = m\vec{v}$$
$$\Delta\vec{p} = m\Delta\vec{v} = \vec{J}$$
$$\vec{F}\Delta t = m\Delta\vec{v}$$
$$P = P'$$

Mechanical Energy

$$W = \Delta E$$
$$W = F\Delta d cos\theta$$
$$E_k = \frac{1}{2}mv^2$$
$$E_p = mg\Delta h$$
$$F_s = -kx$$
$$E_p = \frac{1}{2}kx^2$$
$$E_m = E_k + E_p$$
$$E_m = E_m'$$
$$P = \frac{W}{t} = \frac{\Delta E}{t}$$
$$P = \frac{F\Delta d}{t}$$
$$P = Fv$$
$$eff. = \frac{E_{out}}{E_{in}}$$
$$eff. = \frac{P_{out}}{P_{in}}$$

Electricity

$$q = ne$$
$$|F_e| = \frac{k q_1 q_2}{r^2}$$
$$I_{avg} = \frac{q}{\Delta t}$$
$$V = \frac{W}{q} = \frac{\Delta E}{q}$$
$$R = \frac{\rho l}{A}$$
$$V = IR$$
$$P = \frac{qV}{t}$$
$$P = VI$$
$$P = \frac{V^2}{R}$$
$$P = I^2 R$$
$$E = P\Delta t$$
$$R_T = R_1 + R_2 + R_3 + \cdots$$
$$\frac{1}{R_T} = \frac{1}{R_1} + \frac{1}{R_2} + \frac{1}{R_3} + \cdots$$

Nuclear Physics

$$A = Z + N$$
$$E = mc^2$$
$$\Delta m = m_{nucleons} - m_{nucleus}$$
$$N = N_0 \left(\frac{1}{2}\right)^n$$
$$E = hv$$